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Big Sky PLEASE RETURN

Clearwater

FALL 1985

You Never Miss the Water 'Til the Well Runs Dry

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MONTANA'S DROUGHT





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water and wastewater-treatment  
operators across Montana--is  
published two times a year by

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Montana 59620

# Accidents Happen

## Manhole Safety Contest

BY JAN CRANOR  
WATER QUALITY BUREAU

We received a good response on the cover contest from the last issue of the Big Sky Clearwater. The following is the list of hazards we used in developing the cover drawing.

1. Smoking
2. No gloves
3. No boots
4. No hard hat
5. Short sleeves
6. Pick near manhole
7. Manhole cover upright
8. Bad manhole rung
9. Air blower unused
10. "Men Working" sign not in place
11. Working alone
12. Thin frayed rope in lieu of an adequate harness
13. No safety harness
14. Safety cones not in place
15. Truck location (with respect to traffic)
16. Carrying tool
17. No safety glasses
18. Insect hazard
19. Truck running
20. Rope tied to truck
21. No manhole guard
22. Injured finger
23. No flashing lights
24. Manhole fumes

Most of the comments we received corresponded to our list. However some of them did not such as these:

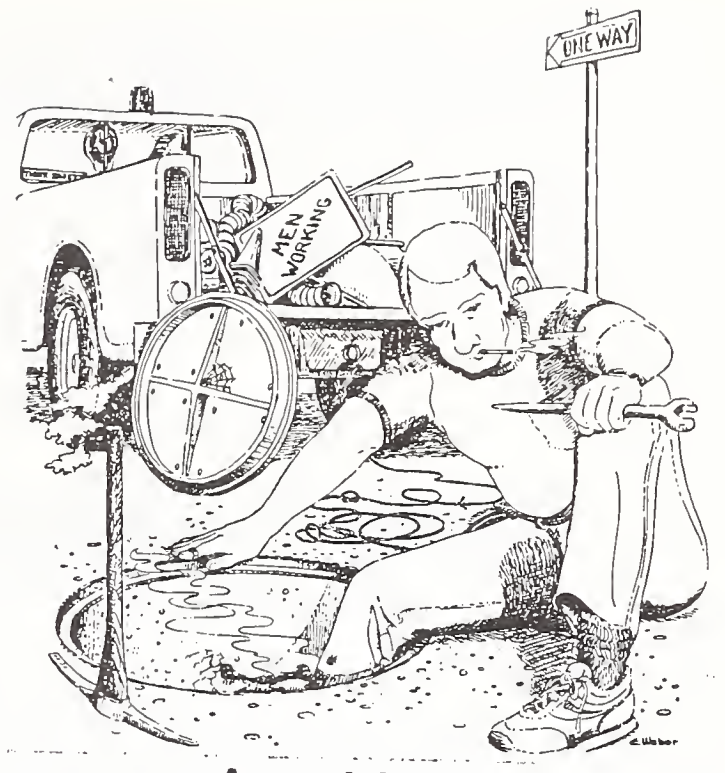
- The man is overweight
- His nose is too big
- He has droopy socks

The best comment we received, which really summed up the theme of the contest, was from Garth Mahns of Harlem, Montana.

"Hopefully we will all look for safety hazards in our own work areas as thoroughly as we did in the picture. I am sure we all noted the irony of the "think safety" sticker surrounded by safety hazards. It points out the fact that safety reminders alone do not produce a safe working environment.

There are many hazards associated with water and wastewater treatment professions. As stated in "Accidents Happen," safety is a matter of common sense. I believe it is also an acquired sense. A sense which must be in tune with not only obvious hazards but potential hazards as well. Stickers, posters and the like are a good means of reinforcement, but you must first lay the ground work for a safe working attitude. Learning to put safety first is an on going process. Workmen should be encouraged to look for and discuss possible hazards on all job sites and work areas.

Set the example by always demonstrating safe working habits in your daily routine. Before performing any task ask yourself what possible hazards may exist and how they can be avoided or prevented."





Three winners were selected in the contest. Tim Hunter of Hamilton identified 22 items from our list. Dave Hembd of Kalispell and Dave Haverfield of Lolo each identified 21 items.

I would like to thank all of you for your participation and enthusiasm in this contest. Thanks also to Ken Johnston, Water Services Company, Helena, for providing the prizes for the winners. Look for more "Accidents Happen" articles and covers in future issues of the Big Sky Clearwater.

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# ***AWWA National Director's Report***

***By Bob Millons***

This has been an exciting year for AWWA. Membership has exceeded 37,300 with the rate of growth at an all time high. The impact of AWWA knowledge and technical expertise is being felt throughout the world as our advice is being sought by virtually all nations of the world.

I'm confident that AWWA is being run by extremely competent and responsible professionals in the water works field. Our new president, Mr. Dick Miller, has set a simple and powerful objective for 1985-86 as he states: "We can meet and solve any challenge using an attitude of contribution instead of confrontation."

The 1985 Annual Conference in Washington D.C. was attended by nearly 10,000 people, exceeding all other conferences. All aspects of the conference were a success. The Board of Directors' meetings were very productive with many new and exciting programs being approved for implementation. Listed below are a few of the highlights which effect Montana in particular:

1. A new dues program is being studied to make joining AWWA easier for "fringe" members such as contractors.
2. The school information program exceeded all expectations and is now being used in thousands of schools throughout the U.S.A. This is a program we in Montana can use.
3. Several new standards were approved. More important was the mandated directive given the Standards Council to accelerate standard approvals. This was started in 1984 and is moving strong this year.

4. Approved \$20,000 for utility memberships recruitment program.
5. The Data Base computer program received 60% of the surveys. This program will be a powerful tool for AWWA members. Great Falls and Billings have been requested to answer the Data Base survey.
6. The new small system operator program was funded again and is moving ahead. We should have available in 1986 a beautiful program designed to assist the small utilities. This is a need we requested and it is being responded to by an enthusiastic committee.
7. Approved Paul A. Schulte as the new Executive Director to succeed David B. Preston.

Many topics and subjects were covered at the conference. If anyone has a particular question or needs a clarification, please contact me at 443-4078.

In conclusion, I must reflect on a basic theme that seems to weave its way throughout the conference. The water works industry is faced with many problems and new ones are constantly being exposed. AWWA has the technology available to meet virtually all problems head on with one stumbling block, money. We are "giving the water away" and not charging enough for this precious commodity. All of us have been challenged to educate everyone that water rates must go up not only in Montana but throughout the nation.

# Water Disappearing in Montana

## You Never Miss the Water 'Till the Well Runs Dry

BY DAN FRASER  
WATER QUALITY BUREAU

Below normal levels of mountain snow pack, extended periods with little or no rainfall and long hot summer days are producing drought conditions in the state of Montana. Streams and reservoirs are generally at lower levels than any of us can remember; many, for all practical purposes, are bone dry. That may be considered the good news! The bad news is, things are probably going to get worse before they get better. Severe drought conditions are causing problems in many areas including agriculture, tourism, fishing and public water supplies.

Public water supplies are of major interest to those of us who deal with public health, therefore they should receive special consideration in terms of the current drought. Many systems across the state have already experienced problems caused by a combination of the increased demand for water for lawn irrigation and depleted water sources. In most cases these systems can avert disaster or emergency conditions by imposing strict controls on lawn irrigation. The first step in irrigation control is usually to limit the number of days, and hours per day, that customers can irrigate. Some systems are only allowing irrigation with hand-held sprinklers and a few are in such dire straights that no irrigation can be allowed.

Probably the lesson we should all learn from the aforementioned problems is that water is not always available in unlimited quantities and operators of public water supplies must keep close track of water usage patterns and water availability to be sure emergency situations are avoided.

Groundwater supplies should be monitored on a regular basis for static and

(Continued on next page)

## Fish and Fowl Hurt by Low Water

BY GLENN PHILLIPS  
FISH, WILDLIFE AND PARKS

The severe drought that Montana is experiencing this summer has affected all of us; everyone from the farmer unable to successfully grow his crops to the homeowner forced to cut back on water for his lawn have felt the impacts of the water shortage. Needless to say, fish populations in many of our favorite streams and waterfowl that nest in our lakes and ponds and along our rivers are also feeling the crunch.

As stream flows are reduced, water temperatures increase and dissolved oxygen concentrations are lowered. Fish and other organisms that live in water are forced into more confined living space, further aggravating the problem. Fish kills resulting from dewatering have already occurred in Warm Springs Creek near Anaconda, Ten Mile Creek near Helena, Ruby River near Sheridan, the East and West Gallatin Rivers near Bozeman and in numerous smaller streams. Major rivers experiencing or expected to experience severely reduced flows (in some reaches) include the Bitterroot, Big hole, Beaverhead, Clark Fork, Dearborn, Musselshell, Powder, Tongue, Madison, Jefferson, Yellowstone and even the mighty Missouri.

Waterfowl production has also suffered a severe setback because of the low water conditions. Islands and shoreline cover that normally provide security for nesting and rearing waterfowl are now easily accessible to predators. Many ponds and small lakes, a mainstay for ducks and geese, have dried up altogether. As a result, 1985 duck breeding counts in Montana are the lowest ever recorded.

August is historically the driest month of the year in Montana, hence the outlook for the rest of the summer is not encouraging. This year more than

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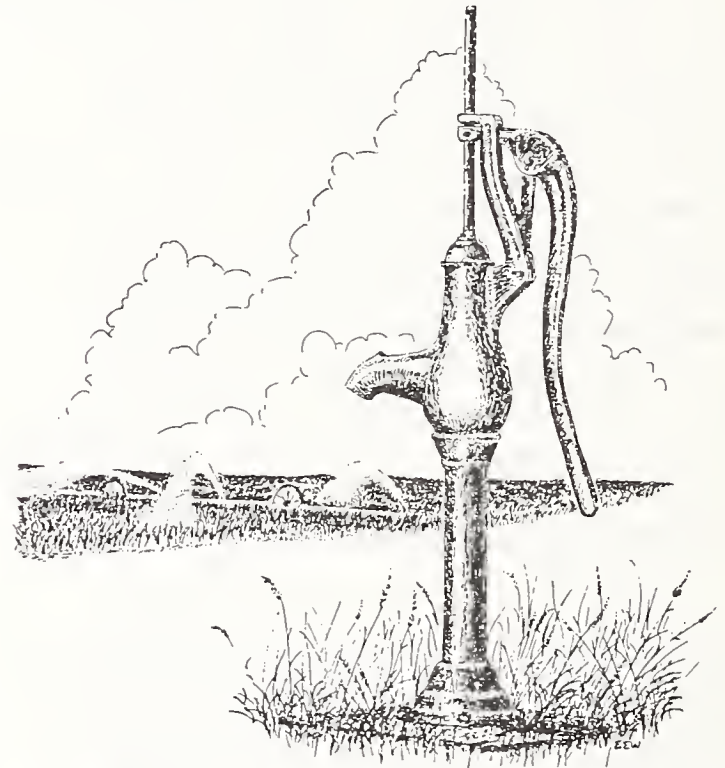
pumping water levels. These records will give operators early warning of impending supply problems. This summer too many systems were unaware of problems until they pumped their wells dry.

Surface water sources should be monitored in terms of flow, available snow pack, reservoir storage availability, etc. Current flows and records of past conditions can be obtained from several sources including the Montana Department of Natural Resources and Conservation, the Montana Bureau of Mines and Geology and the United States Geological Survey.

All public water supply systems need to keep an accurate accounting of water used. At a bare minimum the total amount of water pumped must be metered and individual meters on services are highly desirable to account for water used. Metering is also one of the most effective ways of limiting the wasting of water. Information on various water conservation measures can be obtained from the Water Quality Bureau in Helena, and operators with specific problems should contact them at 444-2406.

any other, we all have a special responsibility to conserve water and to do what we can to avoid contributing to the problem.

Water and Wastewater operators play a significant role during these times of drought. Water operators can promote water conservation measures while the wastewater operator maintains the highest effluent quality achievable with their treatment facilities.



Answers:

1. b, c, d, e
2. c
3. a, d
4. b, c, d, e
5. b

$$\text{volume} = \frac{(\text{diameter})^2 \times \text{height} \times \pi}{4} \times 7.48 \text{ gal/cu. ft.}$$

$$= \frac{4}{(11')^2 \times 4.5' \times 3.14 \times 7.48} = 3197 \text{ gallons}$$

$$\text{pumping capacity (gpm)} = \frac{\text{volume pumped in gallons}}{\text{pumping time in minutes}}$$

$$= \frac{3197 \text{ gallons}}{14 \text{ minutes}} = 228 \text{ gpm}$$

# WATER SCHOOL - Unique Training Experience

The fifty-second Annual School for Water and Wastewater Operators and Managers will be held at Montana State University the week of September 23-26, 1985.

Jointly sponsored by Montana State University and the Montana Department of Health and Environmental Sciences (DHES), the annual Water School provides operators and managers an opportunity to update their skills in obtaining, treating and distributing drinking water and in collecting, treating and disposing of wastewater. The school brings operators and managers together with representatives of the Environmental Protection Agency, DHES Water Quality Bureau, Consulting Engineers and Educators for a unique training experience.

The program will cover a broad range of topics relating to both water and waste. Multiple sessions allow water and wastewater operators to concentrate on their area of speciality, while joint sessions include topics that apply to both water and wastewater. Sessions are planned for both beginning and experienced operators/managers. Many of the lectures will be given by operators familiar with the day-to-day problems that arise in water and wastewater systems. In addition to the more general sessions, we have also scheduled sessions for operator study (SOS). The SOS will offer individualized instruction in solving math, chemistry and hydraulic problems encountered in the day-to-day operation of water and wastewater systems. These sessions should be of great help to those planning to take the Operator's Exam on Friday, September 27 or at other scheduled times throughout the year.

The operator certification exam is administered separately from the Water School. You do not have to take the exam if you attend the Water School, nor do you have to attend the Water School in order to take the exam. However, you should find the exam much easier after four days of intense study at the school. If you wish to take the exam you must contact Rosemary Fossum, DHES, Water Quality Bureau, Cogswell Building, Helena, MT, 444-2691. (See the examination notice elsewhere in this issue.)

This year's registration fee will be \$50, an increase of \$5 over that charged during the last seven years. This minimal fee represents an excellent investment for individuals, cities and industry wishing to upgrade their water and wastewater knowledge. Checks and purchase orders should be made out to Montana State University and be brought to the school; no preregistration for the Water School is necessary. This year's school will be held in the Strand Union Building (SUB). Because university classes will have already begun, we will not be able to arrange on-campus housing for water school participants. Therefore, each person will have to make his/her own arrangements for lodging and meals. We are expecting an informative, useful and exciting school this year. Hope to see you there.

# School Program

## MONDAY, SEPTEMBER 23 - MORNING

- 7:00 - Registration
- 8:30 - Welcome, Response, Operator Certification, Continuing Education Requirements
- 10:00 - Break
- 10:30 - Communications and Public Relations
- 11:45 - Lunch

## Afternoon - Session I - Water Operators

- 1:00 - Overview of Water Treatment, Process and Operator
- 2:30 - Break
- 2:45 - Overview (Continued)
- 4:00 - SOS Overview

## Session II - Wastewater Operators

- 1:00 - Overview of Wastewater Treatment, Process and Operations
- 2:30 - Break
- 2:45 - Overview (Continued)
- 4:00 - SOS Overview

## TUESDAY, SEPTEMBER 24 - MORNING

### Joint Session

- 8:00 - Chlorination, Equipment Safety
- 10:00 - Break

### Session I - Water Operators

- 10:30 - Giardia, Problems and Policy
- 11:10 - To Be Announced
- 11:45 - Lunch

### Session II - Wastewater Operators

- 10:30 - Discharge Permits
- 11:10 - To Be Announced
- 11:45 - Lunch

### Afternoon - Session I - Water Operators

- 1:00 - Turbidity Removal
- 3:00 - Break

### Session II - Wastewater Operators

- 1:00 - Activated Sludge Systems
- 3:00 - Break

### Session III - Water Operators

- 1:00 - Wells
- 3:00 - Break



Session IV - Water and Wastewater Operators

1:00 - Basic Calculations  
3:00 - Break

Joint Session

3:15 - Instrumentation  
4:30 - SOS

WEDNESDAY, SEPTEMBER 25 - MORNING

Joint Session

8:00 - Energy Conservation in Water and Wastewater Treatment  
10:00 - Break  
10:30 - Energy Conservation (Continued)  
11:45 - Lunch

Afternoon - Joint Session

1:00 - Water Distribution Systems and Wastewater Collection Systems  
3:00 - Break

Session I - Water Operators

3:15 - Iron Removal

Session II - Wastewater Operators

3:15 - Sludge Disposal

Session III - Wastewater Operators

3:15 - Lagoons

Session IV - Water and Wastewater Operators

3:15 - Basic Calculations

-----  
4:30 - SOS

THURSDAY, SEPTEMBER 26 - Morning

Joint Session

8:00 - Pump Seals and Packing  
10:00 - Break

Session I - Water Operators

10:30 - Operational Tests for Water Treatment  
11:45 - Lunch

Session II - Wastewater Operators

10:30 - Operational Tests for Wastewater Treatment  
11:45 - Lunch

## Afternoon Session

1:00 - Microbiology in Water and Wastewater Treatment

2:00 - To Be Announced

3:00 - Water School Dismissed

## FRIDAY, SEPTEMBER 27

8:30 - 12:30 Operator Certification

(Separate arrangements must be made with certification office to take this exam.)

# ***CEU Program Planned***

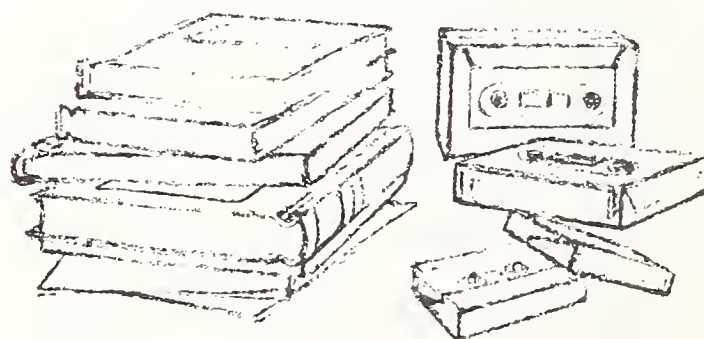
The Water and Wastewater Operators' Council discussed continuing education units (CEUs) for Montana operators at their meeting on April 15, 1985. CEUs are authorized in the operator certification law but the program to implement this provision has not yet been established. At the meeting specific details for a program were recommended to the Department of Health and Environmental Sciences (DHES) which would need to hold a hearing and adopt regulations before a program was implemented.

A CEU program would require that an operator obtain a certain number of hours of training during a one or two-year period in order to keep his license. This training could be in the form of one day seminars, the annual water and wastewater school at Bozeman, correspondence courses, in-plant training courses, etc. Required training will probably amount to 5 to 10 hours per two-year period for each certificate classification with the higher classifications requiring a greater number of hours than the lower ones.

A greater effort on providing training courses will need to be done by agencies, organizations and individuals in order to have an effective CEU program. A detailed listing of training programs which would be held during the year would be provided to the operators.

The earliest that a CEU program could be practically begun is July 1, 1986. CEU units would then need to be acquired during the next two-year period.

As planning for this program progresses, the DHES will provide information to the operators for their comments.





# Examination Notice

ON FRIDAY-----SEPTEMBER 27, 1985-----8:30 A.M. TO 12:30 P.M.

IN ROOM 276, STRAND STUDENT UNION BUILDING, MSU CAMPUS, BOZEMAN, MONTANA

examinations for certification as a Water Distribution Operator, Water Plant Operator, and Wastewater Plant Operator will be administered.

The examinations will be given at the conclusion of the annual Water School to be held on the MSU campus September 23-26. Attendance at the school is not required in order to take a certification examination. However, anyone planning to take an examination should complete a certification application AND examination registration slip before September 13, 1985, and send it to:

## WATER/WASTEWATER OPERATOR CERTIFICATION

Water Quality Bureau - Room A206 - Cogswell Building  
Helena, Montana 59620 - Phone: 444-2691

Annual fees for fiscal year 85/86 payable with application are:

Class 1 - \$27    Class 2 - \$22    Class 3 - \$17    Class 4 - \$12    Class 5 - \$10

Those who have previously submitted certification applications and fees for fiscal year 85/86 will only need to submit Examination Registration Slips (detachable below) with a fee of \$5 per examination. PLEASE RETAIN THE UPPER PORTION OF THIS NOTICE to know the time and place of the examinations. Checks should be made payable to: DHES - Operator Certification. For application materials or information contact the address or phone listed above.

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## EXAMINATION REGISTRATION SLIP

(Detach and return with \$5 per examination by 9/13/85)

I will take the examination(s) I have checked below:

<u>Type</u>	<u>Class:</u>	1	2	3	4	5
Water Distribution (A)		_____	* _____	* _____	* _____	* _____
Water Plant or Well (B)		_____	_____	* _____	* _____	* _____
Wastewater (C)		_____	_____	_____	_____	_____

\*Combination examinations are offered for 2A3B, 3A4B, 4A4B, and 5A5B and require \$5 exam fee remittance only.

NAME: \_\_\_\_\_ ADDRESS: \_\_\_\_\_

# ***Giardia: Unfiltered Surface Water Supplies Face Treatment***

BY JIM MELSTAD  
WATER QUALITY BUREAU

The following article is taken in part from excerpts of the DHES position paper and the DHES white paper on Giardia:

Giardiasis is no newcomer to the communicable disease world. It was discovered more than 300 years ago by master microscopist Anton van Leewenhoek while taking a magnified look at one of his own stools. The flagellated protozan was first described by Dr. F. Lambl, Prague, Czechoslovakia, in 1859. He named it Cercomonas intestinalis. It was later renamed Giardia lamblia for Professor A. Giard, Paris, France and Dr. Lambl.

Giardia is known worldwide. It is often the bane of travelers. Leningrad's tap water is notorious for passing the parasite and trekkers in Nepal are routinely stricken.

The parasite probably was a resident of North America long before man crossed the Bering Straits, however its recent notoriety stems largely from more people using the backcountry, increased person-to-person social contact and greater knowledge about Giardia and how it affects humans.

In Montana, public interest is most often stirred when Giardia invades public drinking water supplies. All public systems that supply unfiltered surface water--from lakes, streams and rivers--to their constituents, run the risk of contamination. The two most common alternatives to insuring surface water is safe to drink include, 1) filtration or 2) drilling wells. Wells are effective because groundwater sources are not susceptible to normal means of contamination.

The first method is to treat the surface water with a properly operated filtration plant followed by disinfection of the water with chlorine. The filtration step can, when the plant is efficiently operated, remove more than 99% of the Giardia cysts present in the surface water. Filtration also removes the water's turbidity (cloudiness) thus making disinfection more efficient. The next step, chlorination of the filtered water, inactivates any cysts or bacteria which may have passed through the filters.

The second method is to develop protected groundwater sources (wells) and abandon the surface water. This is probably the safest and surest means of eliminating the Giardia threat because deep wells are rarely contaminated by Giardia cysts or pathogenic bacteria, and there is not the risk of operator error or equipment failure often associated with treatment plants.

An interim method of treatment for unfiltered surface waters is to maintain an adequate combination of free chlorine residual (C) and chlorine contact time (T) to kill the cysts. Under different water pH and temperature conditions, chlorine can be an adequate disinfection agent if the product of  $C \times T$  is suitable for those water conditions. Below is a table which outlines the necessary CT values for different water conditions. Please note that the cold water (0° Centigrade) CT values are tentative and further research is being conducted to confirm those values.



Calculations of CT values (for 99% inactivation of G. lamblia cysts) from the data of Jarroll, Bingham and Meyer (Appl. Env. Microbiol. 41:483-487) and extrapolation of the data to 0 °C:

pH					
6		7		8	
Temp (°C)	CT <sup>a</sup>	Temp (°C)	CT	Temp (°C)	CT
25	< 15	25	< 15	25	< 15
15	25	15	35	15	50
5	80	5	100	5	150
0	130 <sup>b</sup>	0	150 <sup>b</sup>	0	225 <sup>b</sup>

<sup>a</sup>C (Concentration - mg/liter free residual chlorine); T (time-minutes)

<sup>b</sup>CT values extrapolated from 15 °C and 5 °C data

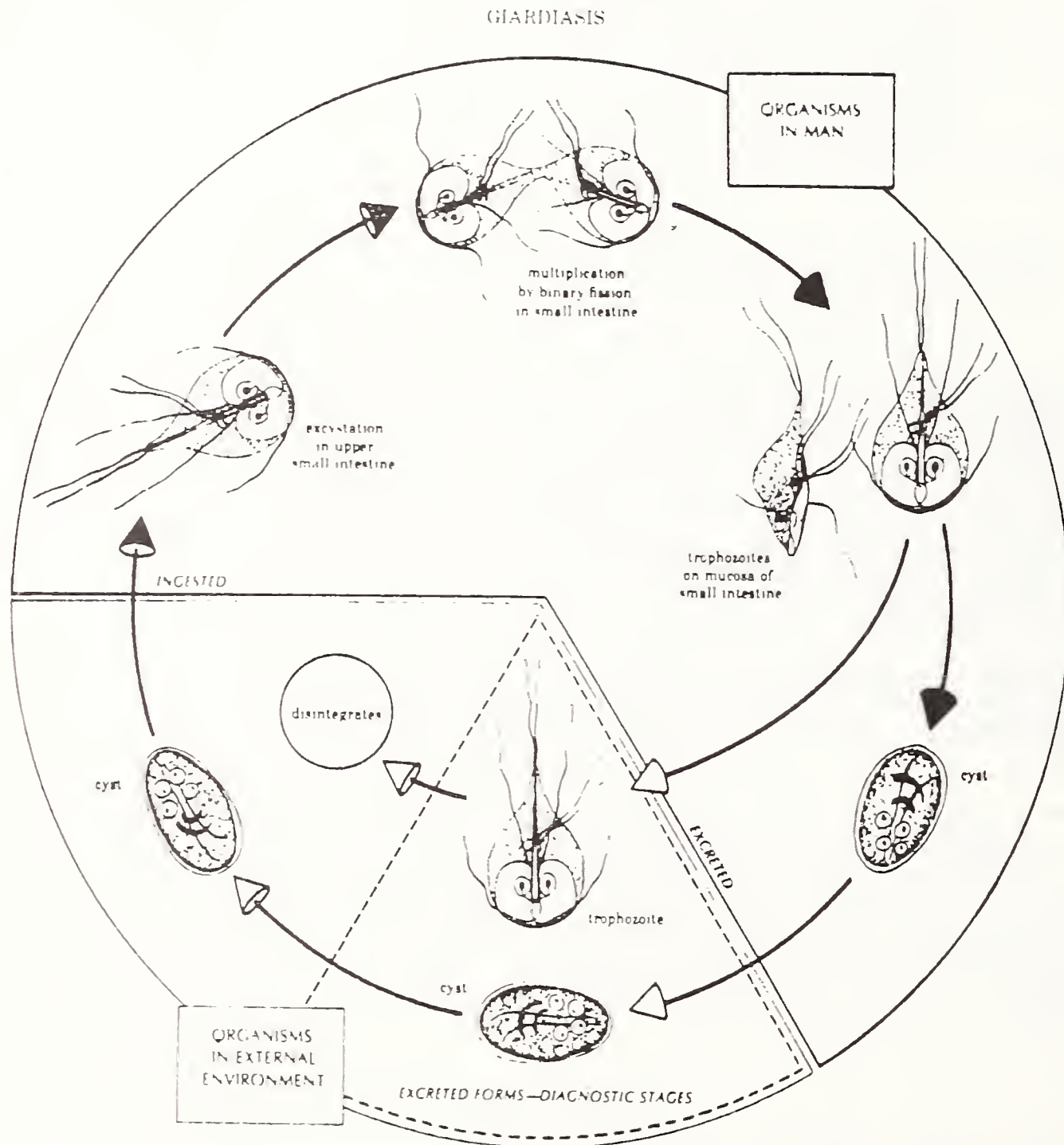
The department will be working with each unfiltered surface water supply to determine whether or not the above values of CT can be met. Since chlorination would be the only barrier to Giardia, additional safeguards such as automatic switchover, flow metering, strict chlorine residual monitoring etc. will be necessary. Whether or not such a chlorination system could become a permanent method of treatment would depend upon the ability of the supply to meet turbidity and other MCL's and also upon proposed amendments to the Safe Drinking Water Act that would require filtration.

The ultimate goal of the DHES is to assure that all of Montana's public water supplies provide safe and palatable water to their users. To help attain this goal, the Department's Water Quality Bureau will examine all public water systems that use surface water to see that the system's treatment procedures are capable of removing or inactivating Giardia cysts. Those systems that are incapable of assuring the provision of safe water, whether for reasons of system or operational deficiencies, will be worked with on an individual basis. Until the DHES can be reasonably assured the necessary improvements are on-line and properly functioning, a health advisory will be issued to the water users so they may take appropriate precautionary measures. Under a health advisory, the department will require the public water system to notify all users of the potential threat to public health. This notification shall include advice on precautionary measures that the department deems effective such as boiling or the use of acceptable point-of-use filtration devices. Public establishments that serve water (motels, restaurants, etc.) will be required to either provide additional treatment for the water or give notice to their customers that there is some health risk associated with consumption of the untreated water. Acceptable statements of notification will be provided by the DHES.

In situations where an outbreak of Giardiasis is linked to a public water supply, the DHES shall issue a boil order which will remain in force until the cause of the outbreak has been discovered and eliminated. Under a boil order, the public will be notified that all water for cooking or drinking must be boiled to assure its safety. Public establishments will be required to provide acceptable treatment for all water served or they will be required to close down until the boil order is lifted.

Persons who would like information about providing filtration and treatment to homes, businesses or public water systems should call the Water Quality Bureau, DHES, 444-2406.

Those who would like more information about the public health risks and treatment of Giardiasis should call their local health departments or the Bureau of Nursing, DHES, 444-4740.



Life cycle of *Giardia* in humans. Reproduced from E.A.Meyer: Microorganisms and Human Disease, NY, Appleton-Century-Crofts, 1974.



# Measuring Sludge

## Wayne Pearson

The Absarokee Navy launched its first vessel last October in the town's sewage treatment pond, its mission, measure the depth of sludge as part of a possible upgrade for the facility.



Captain Wayne Pearson, Chairman of the Sewer Committee, and Ensign Ed Casne, a consulting engineer, stepped aboard around 10:00 a.m. October 10,

amid calm, algae-laden lagoon waters. The request to measure the depth came from Craig Brawner of the Department of Health and Environmental Sciences' Water Quality bureau.

At first glance, it would appear Captain Pearson had either been a fast talker or a highly trustworthy person, since the naval craft had been borrowed from a friend. He had also rigged up some very fancy equipment to perform this measurement, a hollow piece of  $1\frac{1}{2}$ " diameter conduit attached to a rake handle with a steel tape measure. From the picture we have of the event, it appears that the sludge was so potent it ate the tines right off the rake.

Captain Pearson willingly went out in the lagoon waters with Ed since he had already perfected the system two days before when he had taken his grandson on the same "cruise." That was dedication on the part of Wayne and his grandson since there was no way he could have convinced anyone this was his secret spot where they would catch big fish. However, they did see plenty of bait floating amid the other aquatic flora.

Pearson has lived in Absarokee for many years. He owned a ranch at Belmont Canyon and then lived in Midnight Canyon before he moved to town. He is Chairman of the Sewer Committee and seems to have assumed the responsibilities because he enjoys doing it. According to Chuck Egan, if anyone has a problem, they call Wayne. He is also on the Weed Control Committee and is an active participant in all community activities.



# Operators Pass Test

At the water and wastewater operator examinations given in March, 108 persons passed for full and operator-in-training certification.

To be fully certified as a plant operator, an applicant must pass examinations indicating proficiency in certain aspects of chemistry, bacteriology and hydraulics. In addition, certain experience requirements are specified for each level of classification, ranging from six months' experience for Class 4 operators to two years for Class 1 operators.

Those receiving full certification for operator-in-training certification were:

Jimmy Arndt, Great Falls  
Mike Baker, Kalispell  
John Barranger, Whitefish  
Lee Bastian, Great Falls  
Kenneth D. Batchelor, Havre  
Ivan R. Bauer, Missoula  
Robert Benjamin, Fort Benton  
Ray Berntsen, Billings  
Sandra C. Blount, Havre  
Oliver Bones, Polson  
Robert Braun, Bozeman  
Thomas Campbell, Helena  
Charlotte Chichoine, Missoula  
Ralph Christ, Alberton  
Donald J. Clark, Havre  
Kenneth O. Compton, Miles City  
James H. Cornell, Loma  
Steven Cox, Kalispell  
Paul Craig, Carter  
Jerry Crawford, Kalispell  
Bob Cutler, Corvallis  
Mary Davis, Hamilton  
Jon Dodge, Columbia Falls  
Robert Doney, Kevin  
Ernest Eddy, Dillon  
Stephen Feger, Hardin  
Edward Foster, Kalispell  
Doug Frazier, Missoula  
Cindy M. Fuhrmann, Havre  
Gary Fulmer, Lodge Grass  
Rebecca Glidden, Kalispell  
Donald Golder, Victor  
Tom Greason, Bozeman  
Donald Guindon, Anaconda  
Ann Haerr, Livingston  
Michael F. Hagel, Havre  
Michael Hahm, Missoula  
Robert Hampson, Livingston  
Victor Hanson, Belt  
Mark E. Harmala, Billings  
Paul Honey, Darby  
John Hoyt, Bonner  
Les Hudson, Livingston  
W.M. Hungate, Dillon

Tim Hunter, Hamilton  
Eugene Hurlbert, Deer Lodge  
Michael H. Huschle, Bozeman  
Margie W. Jesson, Livingston  
Robert Karterud, Billings  
William Kavanagh, Coram  
Rodney Kelley, Kalispell  
Patrick B. Kimmet, Laurel  
Gerald Kimzey, Kalispell  
Patrick Kirwan, Bozeman  
Richard Kittle, Hamilton  
Robert LeBlanc, Eureka  
Richard Legare, Glendive  
Warren Lindsey, Whitefish  
James H. Cornell, Loma  
William Ludwich, Polson  
William Maurer, Kalispell  
Ed McHugh, Helena  
Chris McIntosh, Gardiner  
Jim Meyer, Vaughn  
Clifford Millar, Thompson Falls  
Lynn Milliron, Florence  
Michael Moodry, Anaconda  
Lyle Mostad, Townsend  
Curtis Myran, Miles City  
Ed Nevala, Great Falls  
Drue A. Newfield, Chinook  
George Nichols, Missoula  
Lori Norby, Boulder  
Dorothy Oftedal, Lakeside  
Carl Oakland, Whitefish  
Michael O'Mary, Whitefish  
Sharon Parker, East Helena  
Michael Peterson, Chinook  
Patrick Pettigrew, Miles City  
Jean Pfau, Sidney  
Mark N. Potter, Bigfork  
Robert R. Potter, Shepherd  
Beth Ranz, Miles City  
Hugh Robertson, Helena  
Robert Rogers, Sunburst  
Michael Satterly, Missoula  
Alan Scheer, Circle  
Hugh Smith, Missoula

Malcolm Smith, Missoula  
Francis Sproul, Kalispell  
Joel Stewart, East Helena  
Robert Stordahl, Glasgow  
Walter Sutheimer, Helena  
Murray Sutton, Belgrade  
Leon Thexton, Ennis  
Paul Torok, Fort Benton  
Bob Van Dyke, Clancy  
Larry Vielleux, Essex  
Michael Wade, Whitefish  
Robert Ward, Missoula  
Curly Weidner, Kalispell  
Mark Weston, Helena  
Walt Whirry, West Glacier  
Donald White, Sidney  
Wayne Whitman, West  
Yellowstone  
Tom Wilson, Fortine  
Jeffrey Wolf, Kalispell  
Gustav Wuelfing, Sheridan  
Kurt Wyant, Anaconda



# Operators Certification Corner

(more than one answer may be correct)

1. Before starting a pump after repairs have been made, which of the following items should be checked?
  - a. Biomass
  - b. Clearances
  - c. Lubrication
  - d. Safety
  - e. Valves
  
2. Short-circuiting in sedimentation basins depends on
  - a. Alkalinity of water
  - b. Backflow prevention devices
  - c. Inlet arrangements of tank
  - d. Jar test results
  - e. pH of water
  
3. Important aspects of a safety program include
  - a. Conducting regular safety programs
  - b. Keeping public informed of utility's safety record
  - c. Maintaining industrial accident records
  - d. Making operators aware of unsafe acts
  - e. Preventing maintenance records from getting lost
  
4. Turbidity is undesirable in drinking water because high turbidity
  - a. Increases corrosivity
  - b. Interferes with disinfection
  - c. Interferes with microbiological determinations
  - d. Prevents maintenance of an effective disinfectant
  - e. Produces aesthetics problems
  
5. Calculate the pumping capacity of a pump in gallons per minute if 14 minutes are required for the water level in a tank to drop 4.5 feet. The tank is 11 feet in diameter and 30 feet high.
  - a. 57 gpm
  - b. 228 gpm
  - c. 1522 gpm
  - d. 380 gpm
  - e. 525 gpm

# SEMINAR SCHEDULE AND TOPICS

## Beginning Sunday, September 8 at 3:30 p.m.

### Sunday, September 8

- 3:30 p.m. • Registration
- 4:00-6:00 p.m. • Introductions and Course Overview
- 6:00-7:00 p.m. • Reception

### Monday, September 9

- 8:30 a.m.-5:00 p.m. • Principles of Financial Management
- Luncheon and Guest Speaker
- Accounting Policies and Practices

### Tuesday, September 10

- 8:30 a.m.-5:00 p.m. • Financial Planning: An Economist's View
- Lunch on own
- Financial Policies, Procedures and Controls

### Wednesday, September 11

- 8:30-5:00 p.m. • Financial Planning and Forecasting
- Luncheon and Guest Speaker
- Investment Markets

### Thursday, September 12

- 8:30 a.m.-5:00 p.m. • Cost Allocation and Rate Design
- 6:00 p.m. • Lunch on own
- Banquet

### Friday, September 13

- 8:30 a.m.-12:00 noon • Microcomputer Workshop — "Finalizing the Corporate Plan"
- Concluding Remarks and Presentation of Certificates



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**Location:** The Fairmont Hotel, Denver, Colorado

**Date:** September 8-13, 1985

**Registration fee:** \$550

Registration includes all student materials, scheduled luncheons, and banquet functions. Reservations and charges for overnight accommodations and additional meals are the responsibility of the individual. Upon receipt of registration, you will be sent a hotel room reservation request form. Reservations must be made by August 17, 1985, to qualify for guaranteed single room rates of \$70, \$85, and \$100 per night.

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